

**FINAL Report for the Operation of Two Monitoring Avian Production and
Survivorship (MAPS) stations on the Lower Colorado River, 2004 Breeding Season**

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Introduction

During the summer breeding season of 2004, the Natural Resources Group, Resource Management Office of the Lower Colorado Region, United States Bureau of Reclamation (Reclamation) operated two Monitoring Avian Production and Survivorship (MAPS) stations along the Lower Colorado River (LCR). The Headgate Rock station was operated near Parker, Arizona for the fifth consecutive year, and the Cibola Nature Trail station was operated for the second year at Cibola National Wildlife Refuge, Arizona.

The MAPS program is cooperative network of bird banding stations operated throughout the U.S., Canada and Mexico. All stations are operated during the summer breeding season, with the principal purpose of documenting use of breeding habitat by birds throughout North America. The data is collected and analyzed by the Institute for Bird Populations (IBP), which also establishes a set of guidelines and protocol for all MAPS stations (DeSante *et al.* 2002). Data from all the stations are compared to one another and long term trends for many bird species are monitored on a continent-wide basis.

Riparian areas of the Southwest support a disproportionately high bird diversity and abundance; yet form less than 0.5% of all the land area (Powell and Stiedl 2000). Much of this habitat has decreased due to climate change, habitat destruction, agricultural land conversion, urban development, mining, overgrazing, and river regulation (Powell and Stiedl 2000, and US Bureau of Reclamation 1996). Data on bird use is being used to monitor restored and non-restored habitats along the LCR. The data is used to document species richness, relative abundance, and individual bird condition that exists between restored and non-restored habitats.

Study Areas

Cibola National Wildlife Refuge is located along the LCR south of Blythe, California in Cibola, Arizona. Established in 1964 to offset wildlife and habitat losses due to channelization of the Colorado River, the refuge attracts more than 200 bird species (U.S. Fish and Wildlife Service – website). The restoration plot contains 3 distinct areas separated into a 5.5 hectare (ha) mixture of honey mesquite (*Prosopis glandulosa*) and screwbean mesquite (*P. pubescens*), 2.6 ha of Goodding willow (*Salix gooddingii*), and 1 ha of Fremont cottonwood (*Populus fremontii*), (Figure 1). A total of 1,500 honey mesquite, 1,500 screwbean mesquite, 10,000 Goodding willow, and 2,600 Fremont cottonwoods were planted (USBR 2003).

The Headgate Rock MAPS station is located along the Colorado River on Colorado River Indian Tribes land near Parker, Arizona. The area measures 19.4 ha and is composed of 3 distinct habitat types; Tamarix sp., a mixture of honey mesquite (*Prosopis glandulosa*) and screwbean mesquite (*P. pubescens*), and arrowweed (*Pulchea sercea*), (USBR 2001). The habitat has been left to develop naturally with the changes along the river and is used as an example of typical habitat found on the river today (Figure 2).

Permits

Banding was conducted under the USFWS Banding Permit #22994, with Barbara Raulston as the Master Bander and Joe Kahl, Greg Clune, Matthew Voisine, Beth Sabin and Chris Dodge as sub-permittees. At least one of the sub-permit holders was present during any banding efforts. We conducted our study at Headgate Rock on Colorado River Indian Tribes land under an annual permit with the tribes.

Methods

During the summer breeding season, MAPS stations were run at the Headgate Rock (HERO) site and at the Cibola (CIBO) site. The MAPS stations were run once every 10-day period, for a total of 10 periods during the months of May to August. Established protocol for MAPS station operations was used at all times (De Sante *et al.* 2002).

At the Cibola site, nine 12m nets and two 6m nets were used. Six 12m nets are located in the Goodding willows, three 12m nets in the Fremont cottonwoods and two 6m nets in the mesquites (Figure 3). These locations were chosen in order to sample the three distinct habitats.

The Headgate Rock site used nine 12m nets and two 6m nets. The net locations were chosen based on habitat areas that would produce the largest numbers of captured birds (Figure 4).

Nets were set up 1/2 hour before sunrise, and closed 5 hours later, or when the temperature exceeded 37.8° C. The nets were checked every 30 to 50 minutes depending on the temperature. All data was recorded on a standardized data sheet (Desante *et al.* 2002). A metal, numbered USFWS band was placed on all captured birds, with the exception of game species and hummingbirds. Each bird was identified to species, aged, sexed, measured for wing chord, body fat and pectoral muscle mass, weighed and released. Time, date, and net location from which a bird was captured were recorded as well as total hours of net operations. Birds were identified to species using Pyle (1997) and National Geographic (1999). Birds were aged and sexed using Pyle (1997).

Bird Condition Analysis

For each bird, wing chord and weight were combined in a ratio of wing chord over weight. Each bird was scored for pectoral muscle mass on a scale of 0-3 (0=concave muscle and prominent sternum, poorer health, 3= convex muscle and sternum undetectable, better health) (Latta and Faaborg 2002, and Gosler 1991). Fat was measured on an ordinal scale according to the protocol established by IBP (DeSante *et al.* 2002). In cases where a bird escaped or for some other reason was not measured for wing, weight, or fat, they were excluded from the bird condition analysis for that species.

Annual Return Rate

Data from recaptured birds were used to measure annual return rate. Annual return rate is a measure of birds recaptured in subsequent field seasons after the field season of their initial capture and is recorded as a percentage (Latta and Faaborg 2001, 2002).

Bird Safety

All operations of the banding station were conducted with bird safety as the first priority. If weather conditions, number of captures, or other circumstances were deemed to be unsafe, nets were closed immediately and banding ceased or until conditions improved. Injured birds were cared for and released as soon as possible. All birds were processed in a quick and timely manner in order to reduce stress caused by handling. Standard protocols for bird extraction and handling, as established by Ralph *et al.* (1993), and De Sante *et al.* (2002), were followed at all times.

Vegetation Monitoring

A vegetation monitoring protocol was established to collect data on total vegetation volume (TVV) in order to gain further knowledge of how bird captures from constant effort mist-net operations may be associated to vegetation characteristics of the banding sites. This information was collected once during the summer season. At each site, measurements were taken from a starting point located at the center of each net lane. Two randomly chosen transects were established from each net lane. One transect was run on either side of the lane, at a length of 20 m. Along each transect, points were taken at every 2 m for a total of 20 points taken from each net lane. At each point, a 7.5 m pole was used to measure vegetation hits at every dm section of the pole. At every 10 cm section, a hit was recorded if any vegetation fell within a 10 cm radius of the pole. This gave measured sections of 0.1m tall and 0.1m radius. For each hit, the plant species was recorded. Hits were estimated for all vegetation over 7.5 m in height. The data was then used to estimate TVV for each meter of height, and for the entire site as a whole. The data was also broken down to the percentage of each plant species making up the total number of hits for the entire site and per meter of height. This protocol was based on Mills *et al.* (1991). TVV was calculated using the formula:

$$TVV = h/10p$$

h= the total numbered of hits recorded for all the plots measured at one site.

p= all the decameter height sections measured.

Results

For 2004, a total of 204 captures were recorded at the Parker Site and 415 captures were recorded at the Cibola Site, over the ten banding periods conducted. A capture included all birds taken out of the nets, including new captures, recaptures, banded and unbanded birds. A total of 490.5 net hours were operated for the season at the Parker Site and a total of 463.9 net hours were operated at the Cibola Site. This equates to a total capture rate of .41 birds per net hour at Parker (.41 for 2003) and .89 birds per net hour at Cibola (.84 for 2003). Differences in net hours were due to wind or heat related net closures which caused some days efforts to be shorter than others. The annual return rate for the Parker site was 8.62% up from 7.83% in 2003. The annual return rate for the Cibola site was

6.83%. This is the first year annual return rate was calculated for Cibola because only two years of data have been collected.

Between site comparisons HERO/CIBO

There was an obvious difference in the species composition caught at both sites. Only three species were commonly (>10 captures) caught at both sites: Wilson's warbler (*Wilsonia pusilla*), common yellowthroat (*Geothypis trichas*), and western flycatcher (*Empidonax difficilis/Empidonax occidentalis*). The following two pie charts illustrate the resident species which were captured at each site. A list of the American Ornithological Union (AOU) accepted four letter codes for all the bird species captured at one of the two MAPS sites is located in Appendix A.

At HERO, a total of 32 different species were captured over the entire banding season (33 in 2003). A total of 39 species were captured at the Cibola MAPS site (41 in 2003).

As in 2003, the two sites did show noticeable differences in capture numbers for several species. At CIBO, blue grosbeak (*Guiraca caerulea*), Bullock's oriole (*Icterus bullockii*), and house finch (*Carpodacus mexicanus*) were more abundant. At HERO, the common yellowthroat, the yellow warbler (*Dendroica petechia*), and the verdin (*Auriparus flaviceps*) were captured in noticeably higher numbers. Data for the condition index and pectoral muscle mass of several bird species, for both sites, may be found in appendix B. The figure below illustrates the differences in captures for each resident species.

Total Vegetation Volume (TVV)

Plant species composition varied between sites. Of all the species which formed at least 5% of the total measured vegetation present at one of the sites, none were found at higher than 5% at both sites. At HERO, the habitat is dominated by tamarisk (*Tamarix spp.*), screwbean mesquite (*Prosopis pubescens*), and arrowweed (*Pulchea sercea*). At CIBO, the habitat was dominated by cottonwood (*Populus fremonti*), Johnson grass (*Sorghum halapense*), and Goodding's willow (*Salix gooddingii*).

Discussion

During the 2004 season, CIBO attracted a larger number of birds and a greater diversity of birds for the second year in a row as compared to the HERO site. Seven more species were present at CIBO with a capture rate double that of the HERO site. Seventeen species were present at both sites. The higher bird numbers at CIBO may be due to the greater occurrence of native vegetation. Fleishman *et al.* (2002) showed greater bird numbers, species richness, and diversity in some areas of the Mohave Desert with a greater native vegetation component and greater structural complexity.

Differences in species composition may be influenced by the habitat surrounding the site. Red-wing blackbirds and house finches comprised a large component of total bird numbers at CIBO in 2003 and 2004. These species use the surrounding agricultural habitat to forage, and were nesting in the wet mesquite/baccarus areas of the site. HERO

captured a number of non migrating upland desert birds not present at the CIBO site, like the cactus wren, black-throated sparrow, lesser nighthawk, crissal thrasher, and the loggerhead shrike. These species forage in the riparian habitat after fledging or nesting in upland desert surrounding HERO and were generally caught late in the breeding season.

Certain species of birds often found in or near riparian zones are found only in very small numbers at both sites, including the yellow warbler (*Dendroica petechia*), Bell's vireo (*Vireo bellii*), and Lucy's warbler (*Vermivora luciae*). All three of these species are documented as having suffered declines in numbers along the LCR over the 20th century and, in some cases, having recovered somewhat (Rosenberg 1991). These species are often found in healthy, mature habitat and were common along the river at the beginning of the 20th century (Rosenberg 1991). Lucy's warblers are dependent on mature mesquite with cavities for nesting purposes and may not occur in larger numbers at the Cibola site until the mesquites mature. Bell's vireo and yellow warbler are associated with large cottonwoods and may become more common as the cottonwood /willow sections of the Cibola site grow larger. Close attention should be paid to these species to determine if their use of either site increases in the future.

Figure 1. Aerial photo of the Cibola MAPS station, with the position of net lanes as red lines.

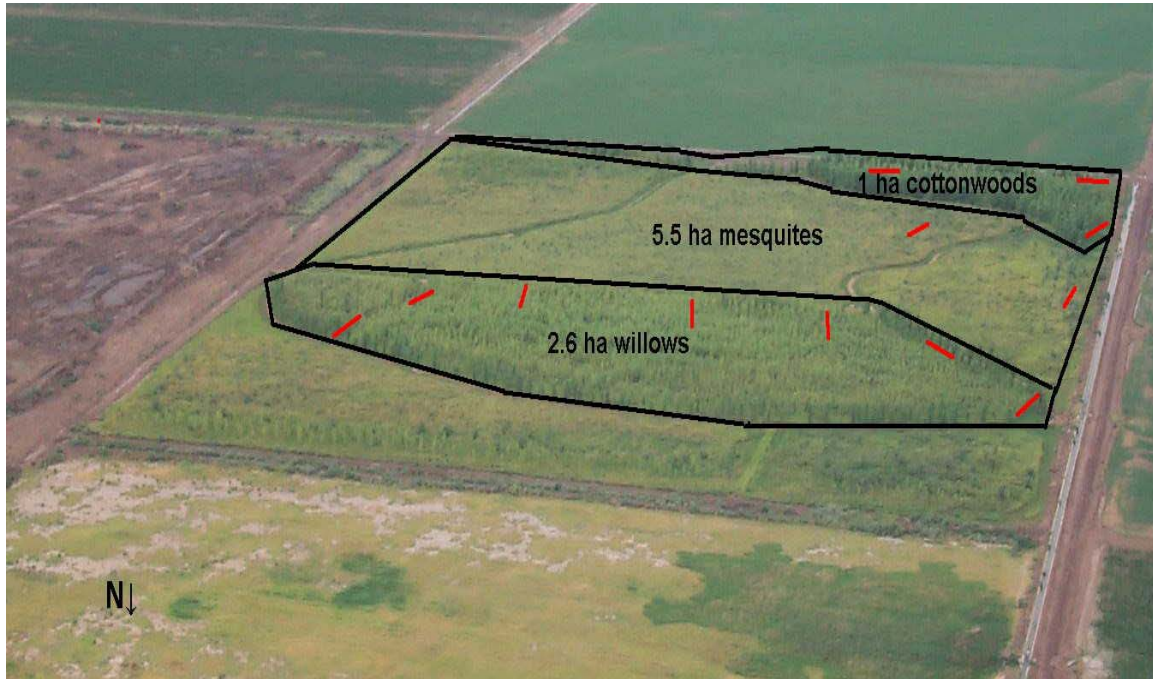


Figure 2. Headgate Rock MAPS station, with net lane positions shown in red and station boundary in green.

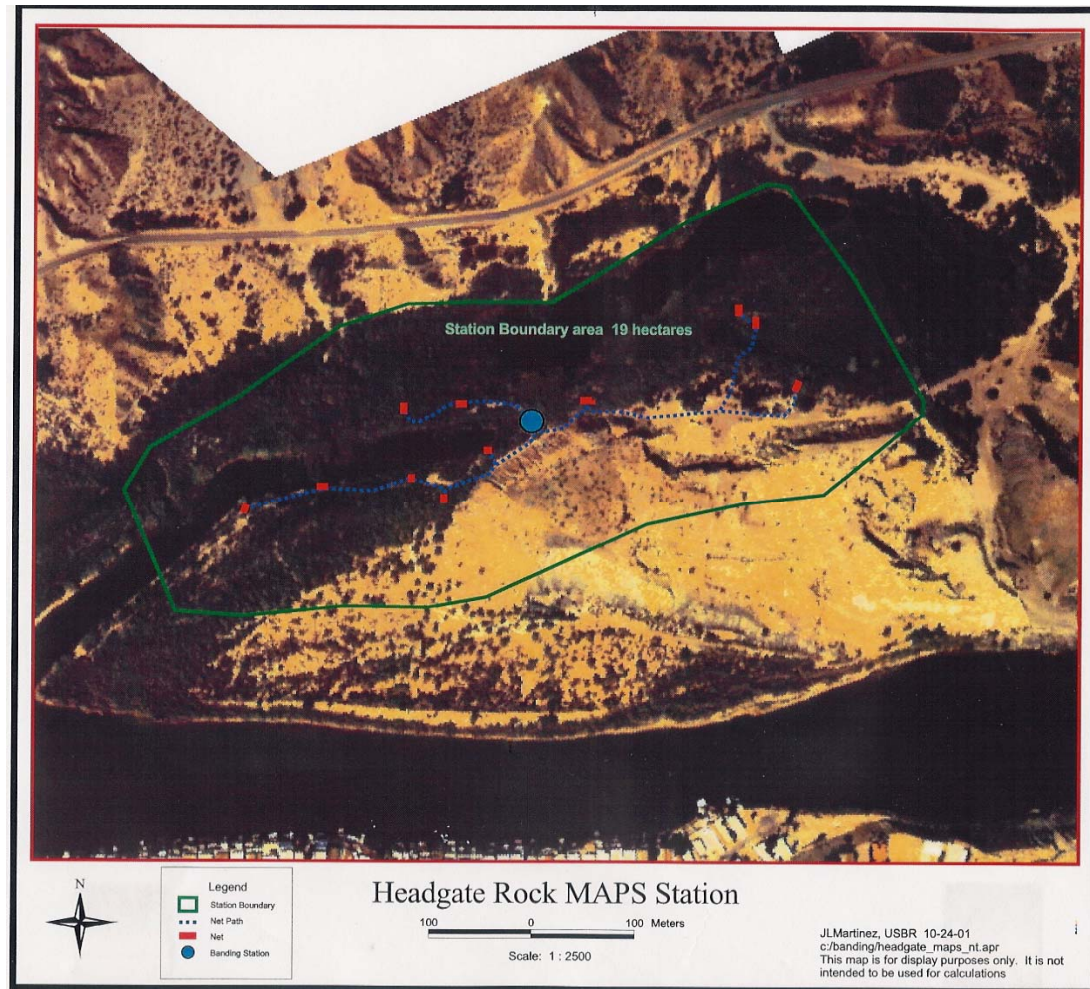


Figure 3. Captures, per species, of summer resident birds at the Cibola MAPS site for the 2004 season. Numbers of birds captured, and the percentage of the total birds captured is shown.

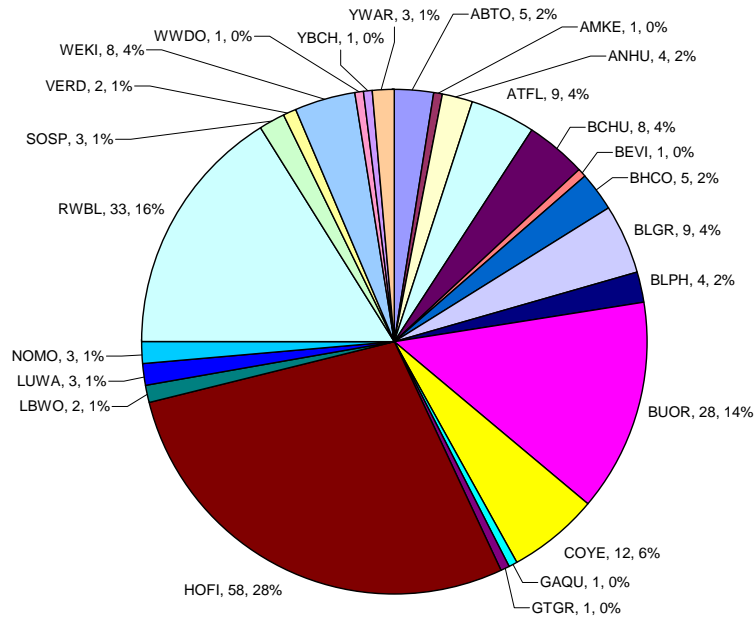


Figure 4. Captures, per summer resident species for the 2004 MAPS season at the HERO site. Numbers of birds captured, and the percentage of the total birds captured is shown.

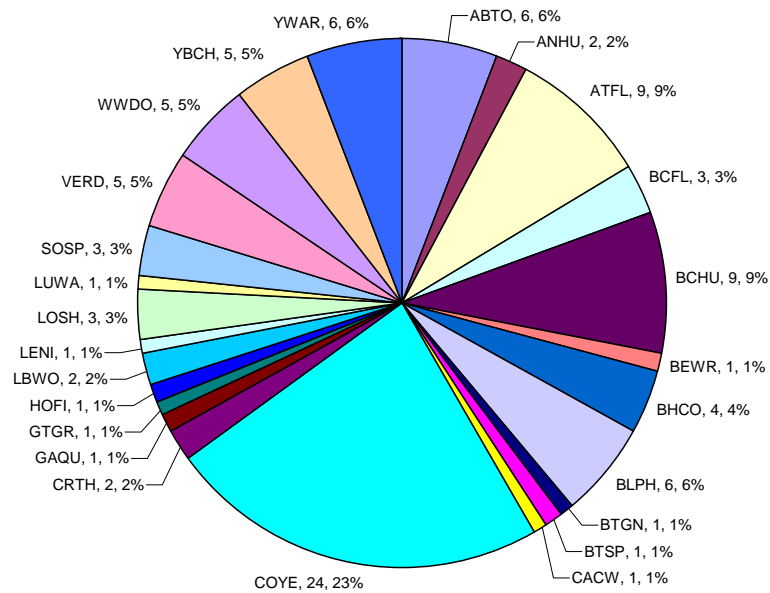


Figure 5. Comparison of birds per net hour for several resident species common to either of the two sites.

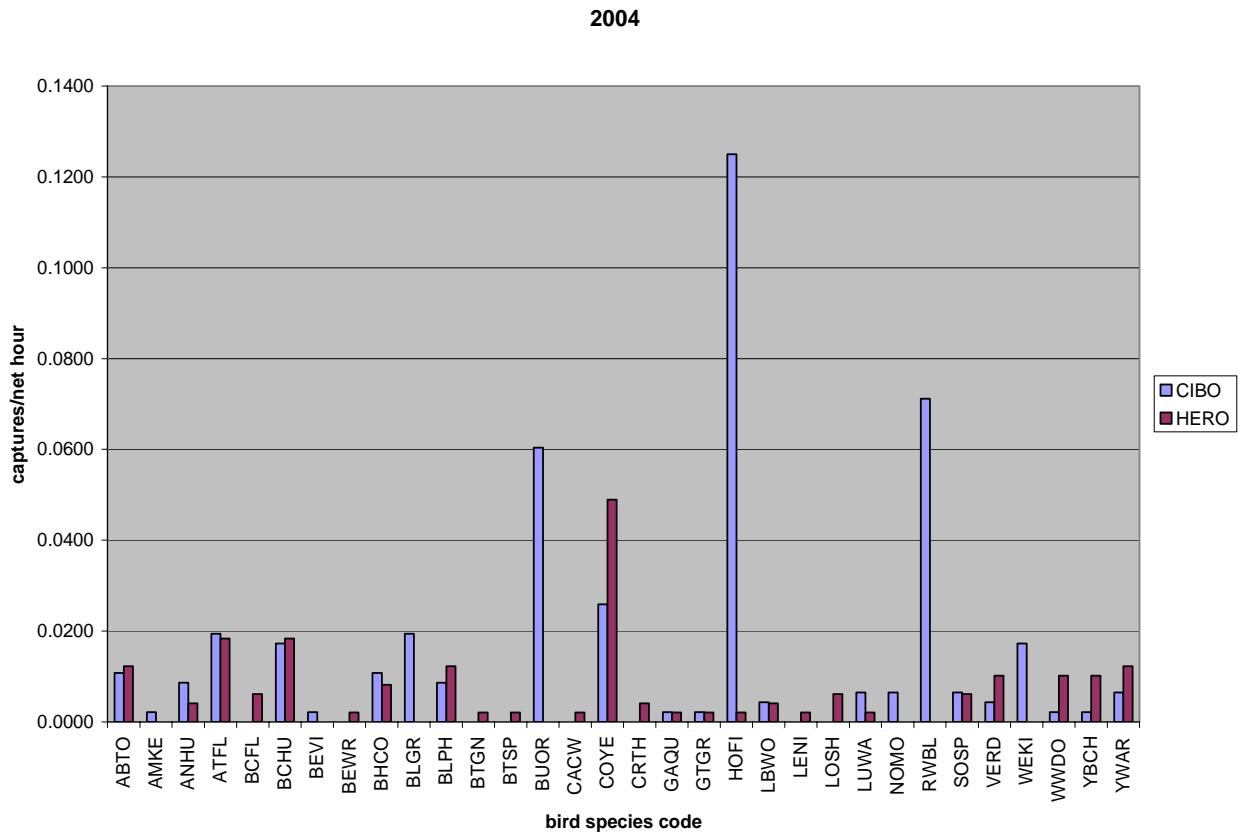
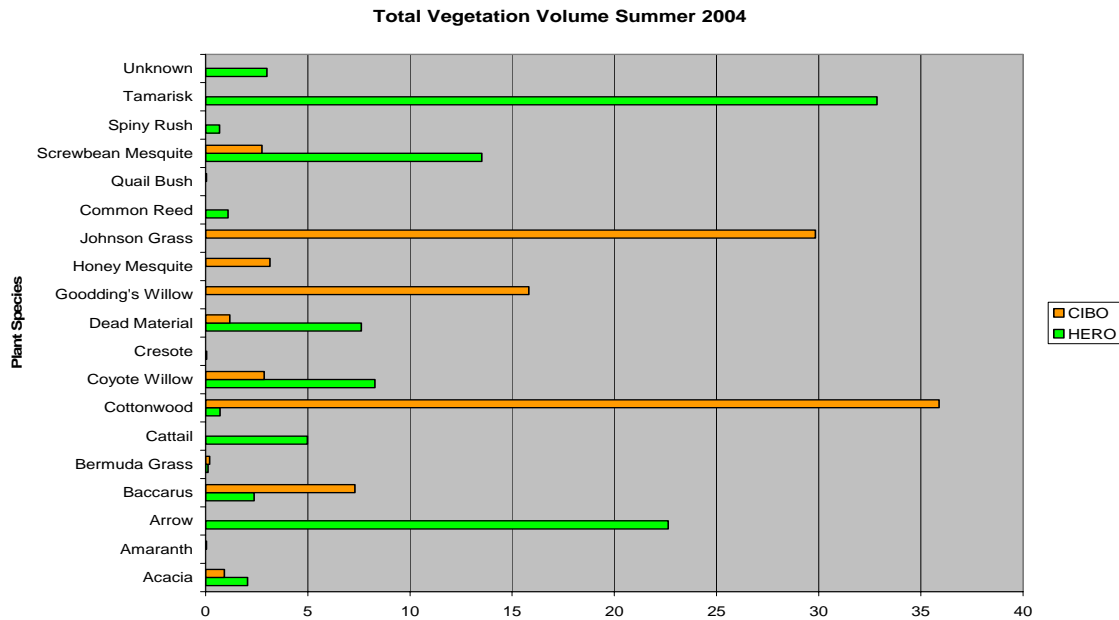


Figure 6. Comparison of relative percentages of plant species found from vegetation surveys at both sites. Those species which constituted more than 5% of the total vegetation at one of the sites are highlighted in grey in the table below.



Plant Species	HERO	CIBO
Acacia (<i>Acacia greggii</i>)	2.05	0.92
Amaranth (<i>Amaranthus gangeticus</i>)	0.00	0.04
Arrowweed (<i>Pulchea sercea</i>)	22.64	0.00
Baccarus (<i>Baccharus glutinosa</i>)	2.37	7.31
Bermuda Grass (<i>Cynodon dactylon</i>)	0.12	0.19
Cattail (<i>Typha latifolia</i>)	4.99	0.00
Common Reed(<i>Phragmites australis</i>)	1.10	0.00
Cottonwood (<i>Populus fremonti</i>)	0.71	35.89
Coyote Willow (<i>Salix exigua</i>)	8.29	2.87
Cresote (<i>Larrea tridentata</i>)	0.05	0.00
Dead Material	7.63	1.19
Goodding's Willow (<i>Salix goodingi</i>)	0.00	15.82
Honey Mesquite (<i>Prosopis glandulosa</i>)	0.00	3.15
Johnson Grass (<i>Sorghum halapense</i>)	0.00	29.84
Quail Bush (<i>Atriplex lentiformis</i>)	0.00	0.04
Screwbean Mesquite (<i>Prosopis pubescens</i>)	13.52	2.76
Spiny Rush (<i>Juncus acutus</i>)	0.68	0.00
Tamarisk (<i>Tamarix spp.</i>)	32.85	0.00
Unknown	3.01	0.00

Appendix A. Standard AOU (American Ornithological Union) Codes used for North American Bird Species.

<u>Code</u>	<u>Common Name</u>	<u>Scientific Name</u>
AMKE	American kestrel	Falco parverius
LENI	lesser nighthawk	Chordeiles acutipennis
GAQU	Gambel's quail	Callipepla gambelii
COGD	common ground-dove	Columbina passerina
ANHU	Anna's hummingbird	Calypta anna
LBBO	ladder-backed woodpecker	Picoides scalaris
WWPE	western wood pee-wee	Contopus sordidulus
WIFL	willow flycatcher	Empidonax trailii
HAFL	Hammond's flycatcher	Empidonax hammondii
GRFL	grey flycatcher	Empidonax wrightii
DUFL	dusky flycatcher	Empidonax oberholseri
WEFL	western flycatcher	Empidonax difficilis or occidentalis
BLPH	black phoebe	Sayornis nigricans
ATFL	ash-throated flycatcher	Myiarchus cinerascens
WEKI	western kingbird	Tyrannus verticalis
BEVI	Bell's vireo	Vireo belli
PLVI	plumbeous vireo	Vireo plumbeus
WAVI	warbling vireo	Vireo gilvus
VERD	verdin	Auriparus flaviceps
RBNH	red-breasted nuthatch	Sitta canadensis
BEWR	Bewick's wren	Thryomanes bewickii
CACW	cactus wren	Campylorhynchus brunneicapillus
HOWR	house wren	Troglodytes aedon
MAWR	marsh wren	Cistothorus palustris
RCKI	ruby-crowned kinglet	Regulus calendula
BGGN	blue-grey gnatcatcher	Poliophtila caerulea
BTGN	black-throated gnatcatcher	Poliophtila melanura
SWTH	Swainson's thrush	Catharus ustulatus
HETH	hermit thrush	Catharus guttatus
AMRO	American robin	Turdus migratorius
CRTH	crissal thrasher	Toxostoma crissale
PHAI	phainopepla	Phainopepla nitens
OCWA	orange-crowned warbler	Vermivora celata
NAWA	Nashville warbler	Vermivora ruficapilla
LUWA	Lucy's warbler	Vermivora luciae
YWAR	yellow warbler	Dendroica petechia
AUWA	yellow-rumped (Audobon's) warbler	Dendroica coronata audoboni
MYWA	yellow-rumped (Myrtle's) warbler	Dendroica coronata coronata
BTYW	black-throated grey warbler	Dendroica nigrescens
TOWA	Townsend's warbler	Dendroica townsendi
AMRE	American redstart	Setophaga ruticilla
MGWA	Macgillivray's warbler	Oporornis tolmiei
COYE	common yellowthroat	Geothypis trichas
WIWA	Wilson's warbler	Wilsonia pusilla
YBCH	yellow-breasted chat	Icteria virens
SUTA	summer tanager	Piranga rubra
WETA	western tanager	Piranga ludoviciana
GTTO	green-tailed towhee	Pipilo chlorurus
ABTO	Abert's towhee	Pipilo aberti
CHSP	chipping sparrow	Spizella passerina

Code

VESP
BTSP
SAVS
FOSP
SOSP
LISP
WTSP
WCSP
GWCS
BHGR
BLGR
LAZB
WEME
GTGR
BHCO
HOOR
BUOR
HOFI
LEGO

Common Name

vesper sparrow
black-throated sparrow
savannah sparrow
fox sparrow
song sparrow
Lincoln's sparrow
white-throated sparrow
white-crowned sparrow
Gambel's white-crowned sparrow
black-headed grosbeak
blue grosbeak
lazuli bunting
western meadowlark
great-tailed grackle
brown-headed cowbird
hooded oriole
bullock's oriole
house finch
lesser goldfinch

Scientific Name

Poocetes gramineus
Amphispiza bilenata
Passerculus sandwichensis
Passerela iliaca
Melospiza melodia
Melospiza lincolnii
Zonotrichia albicollis
Zonotrichia leucophrys
Zonotrichia l. gambelii
Phueciticus melanocephalus
Guiraca caerulea
Passerina amoena
Sturnella neglecta
Quiscalus mexicanus
Molothrus ater
Icterus cucullatus
I. bullocki
Carpodacus mexicanus
Carduelis psaltria

Appendix B. Parker MAPS (HERO) station in Parker, AZ. and Cibola MAPS (CIBO) station in Parker, AZ. Tables and figures of data presented for interpretation.

Figure B1. Comparisons of fat measurements over the five years of banding at the HERO MAPS station.

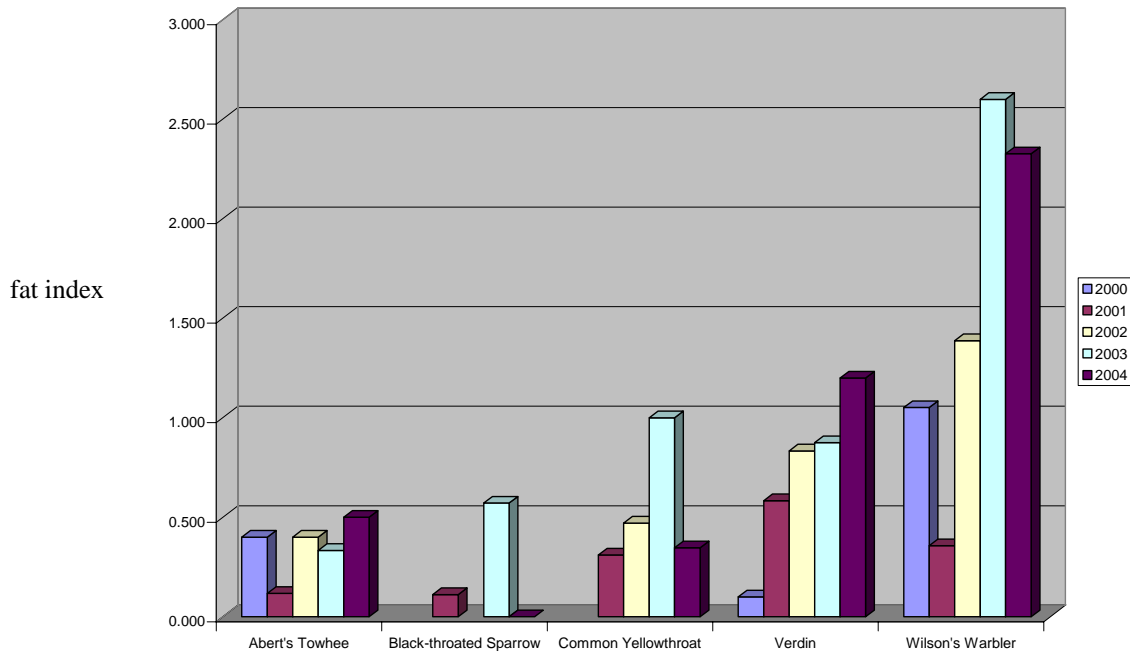


Figure B2. Average PMM between years (2003-2004) value for common species at Parker (HERO) MAPS station.

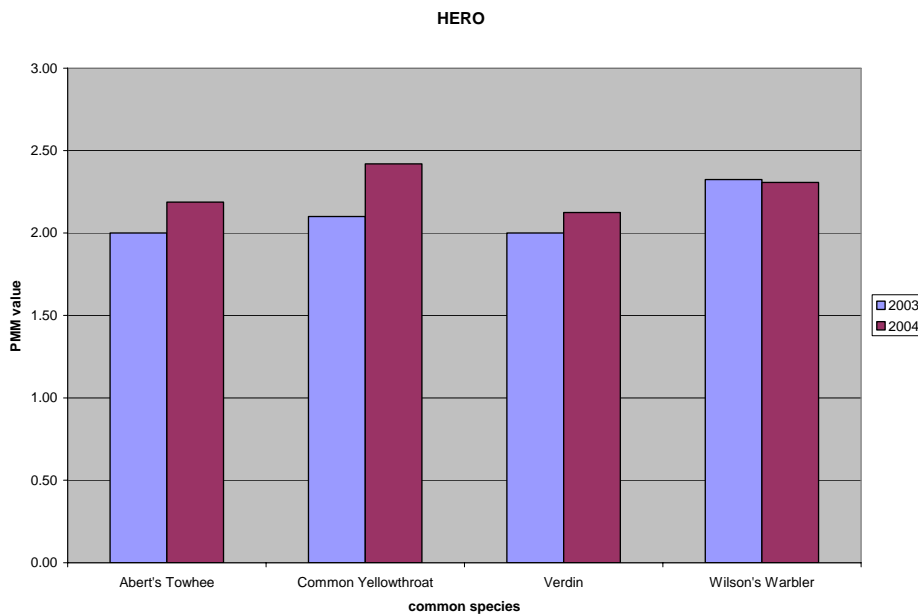


Table B1. Numbers of captures per year, for five common species, HERO MAPS site.

<u>Species name</u>	2000	2001	2002	2003	2004
Abert's Towhee	12	15	4	10	6
Black-throated Sparrow	1	9	0	8	1
Common Yellowthroat	2	26	15	10	24
Verdin	10	14	6	10	5
Wilson's Warbler	66	30	77	43	51

Figure B3. Between year (2003-2004) average fat levels at Cibola MAPS site.

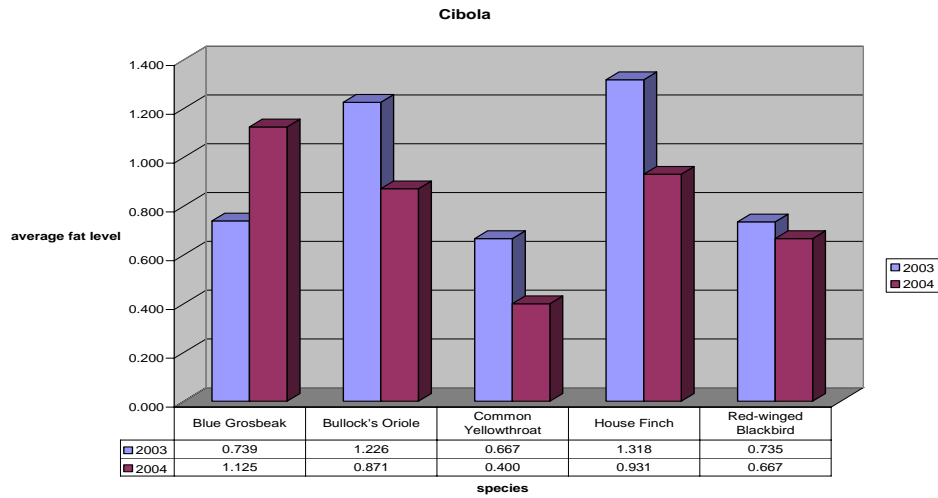


Figure B4. Between year (2003-2004) average PMM for five species captured at the CIBO MAPS site.

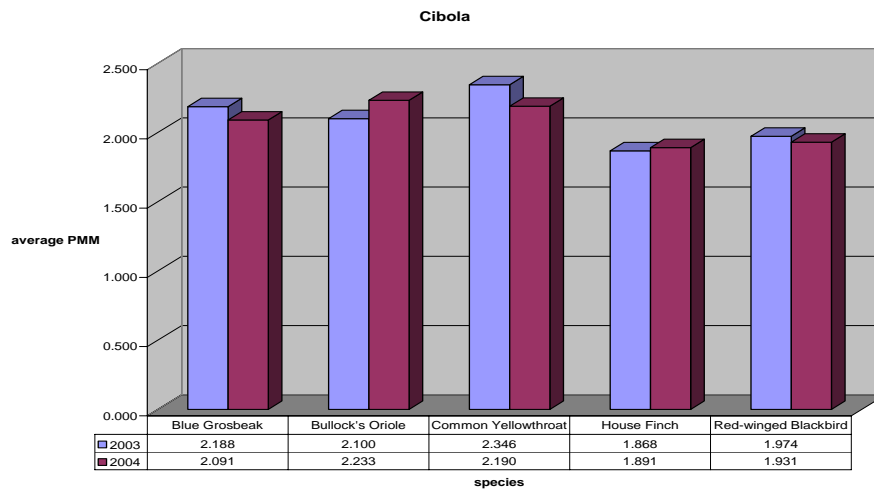
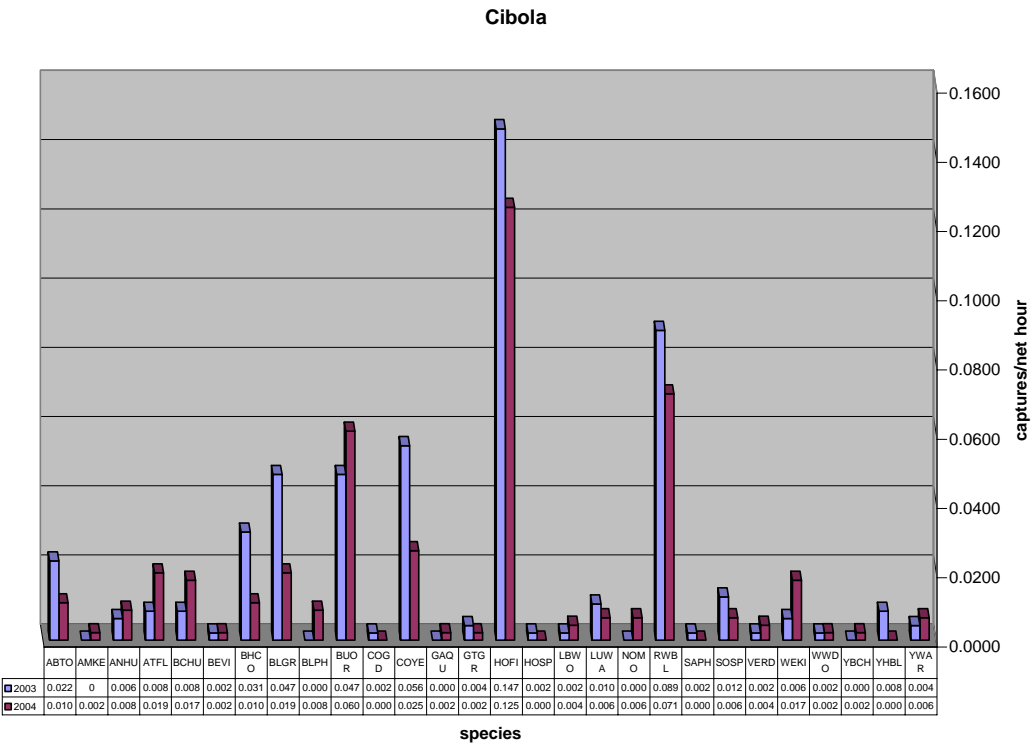


Figure B5. Between year (2003-2004) comparison of captures per net hour at the Cibola MAPS site.



Literature Cited

- Bibby, Colin J.; Burgess, Neil D; Hill, David A. 1992. Monitoring Bird Populations. Academic Press Inc. San Diego, CA.
- Desante, David F.; Burton, Kenneth M.; Velez, Pilar; Froehlich, Dan. 2002. Maps Manual 2002 Protocol instructions for the establishment and operation of constant-effort bird-banding stations as part of the monitoring avian productivity and survivorship (MAPS) program. The Institute for Bird Populations. Point Reyes Bird Observatory Bolinas, CA.
- Fleishman, Erica.; Dennis D. Murphy; Ted Floyd; Neil McDonal, and Jack Walters. 2002. Characterization of riparian bird communities in a Mojave Desert watershed. Great Basin Birds 5(1). Pp 38-44.
- Gosler A.G. 1991. On the use of greater covert moult and pectoral muscle as measures of condition in passerines with data for the greater tit *Parus major*. Bird Study 38: 1-9.
- Latta, Steven C. and John Faaborg. 2001. Winter site fidelity of prairie warblers in the Dominican Republic. The Condor: Vol. 103, No. 3, pp. 455-468.
- Latta, Steven C. and John Faaborg. 2002. Demographic and population responses of Cape May warblers wintering in multiple habitats. Ecology: 83(9), pp. 2502-2515.
- Mills, Scott G., John B. Dunning Jr., and John M. Bates. 1991. The relationship between breeding bird density and vegetation volume. Wilson Bulletin: 103(3). Pp. 468-479.
- National Geographic Society. 1999. Field guide to the birds of North America, Third edition. National Geographic Society, Washington D.C. 457 pp.
- Nur, N., S.L. Jones, and G.R Geupel. 1999. A statistical guide to data analysis of avian monitoring programs. U. S Department of the Interior, Fish and Wildlife Service, BTP-R6001-1999, Washington, D.C.
- Powell, Brian F., and Robert J. Stiedl. 2000. Nesting habitat and reproductive success of southwestern riparian birds. The Condor 102:823-831.
- Pyle, Peter. 1997. Identification guide to North American birds. Slate Creek Press, Bolinas, CA
- Ralph, C. John.; Geupel, Geoffrey R.; Pyle, Peter.; Martin, Thomas E.; Desante, David F. 1993. Handbook of field methods for monitoring landbirds. U.S Department of Agriculture; Gen. Tech. Rep Report PSW-GTR-144. Pacific Southwest Research Station, Albany, CA.
- Rosenberg, Kenneth V., R.D. Ohmart, W.C. Hunter and B.W. Anderson. 1991. Birds of

the Lower Colorado River Valley. The University of Arizona Press. Tucson, AZ. 416 pp.

- U. S. Bureau of Reclamation 2001. Yearly report for the 2001 MAPS field season. Report for the Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada. 3 pp.
- U. S. Bureau of Reclamation 2003. Habitat Restoration on the Lower Colorado River Demonstration Projects: 1995-2002. U. S. Department of the Interior, Lower Colorado Regional Office, Bureau of Reclamation. Boulder City, NV.
- U. S. Fish and Wildlife Service 1997. Biological and conference opinion on lower Colorado operations and maintenance- Lake Mead to southerly international border. Biological opinion issued to the Bureau of Reclamation. 1997.
- U. S. Fish and Wildlife Service. 2003. Cibola National Wildlife Refuge. <http://southwest.fws.gov/refuges/arizona/cibola.html>. Accessed Sept. 2003